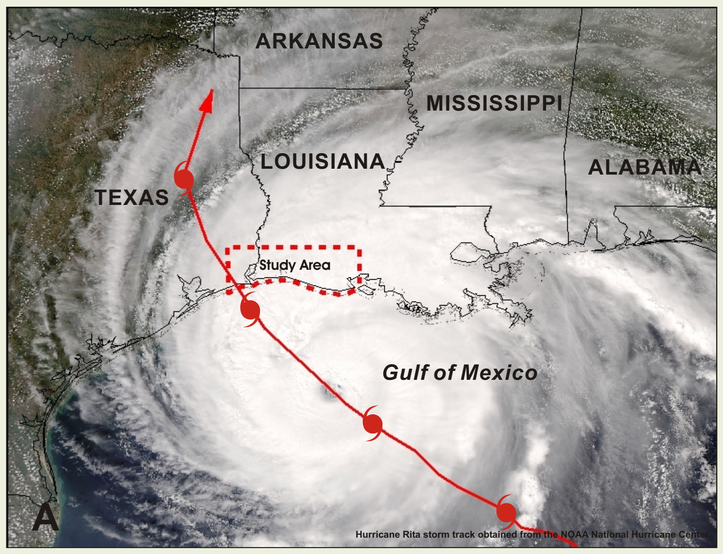
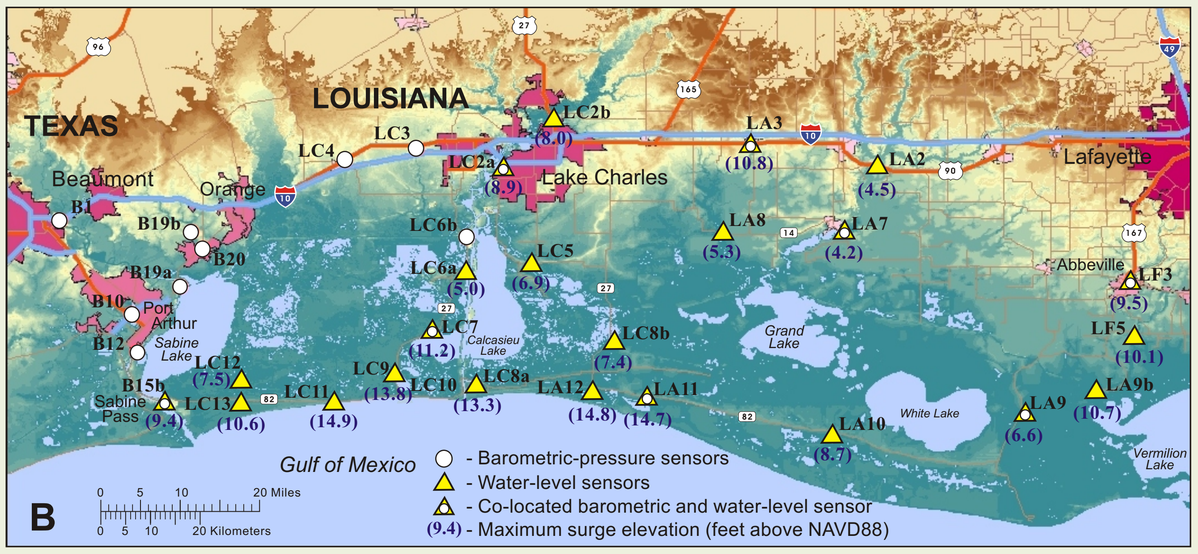
USGS
science for a changing world

Monitoring Hurricane Rita Inland Storm Surge



Map showing path of Hurricane Rita and study area.



Map showing locations of storm-surge sensors in southwestern Louisiana and southeastern Texas.

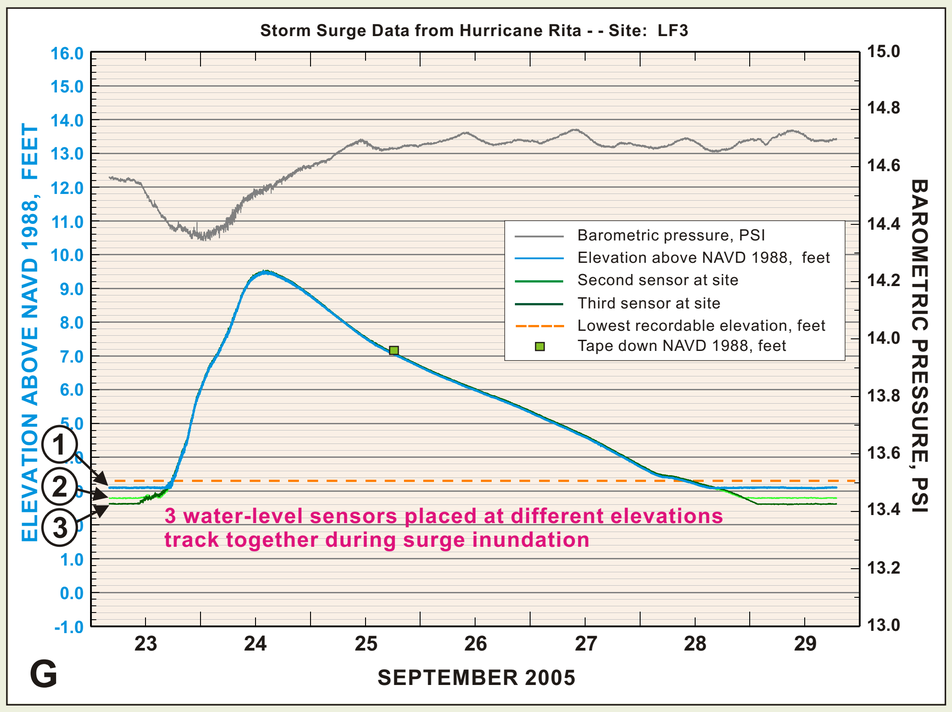
Water-level and barometric-pressure sensor.

A Mobile Network of Storm-Surge Sensors

As Hurricane Rita approached the Texas and Louisiana coasts (A), the U.S. Geological Survey deployed an experimental water-level and barometric-pressure gage network to record the magnitude, extent, and timing of inland hurricane storm surge and coastal flooding. A total of 47 sensors (34 water-level and 13 barometric-pressure) were deployed from September 22-23, 2005. Sensors were located from Sabine Pass, Texas, through Abbeville, Louisiana, at distances ranging from a few hundred feet to approximately 30 miles inland (B). Sensors (C) were encased in 1.5 inch by 18 inch metal pipes (D) and strapped to permanent objects, such as piers and power poles (D, E, and F). The sensors recorded pressure and temperature readings every 30 seconds during the storm and for several days afterwards.

Recovering the Sensors

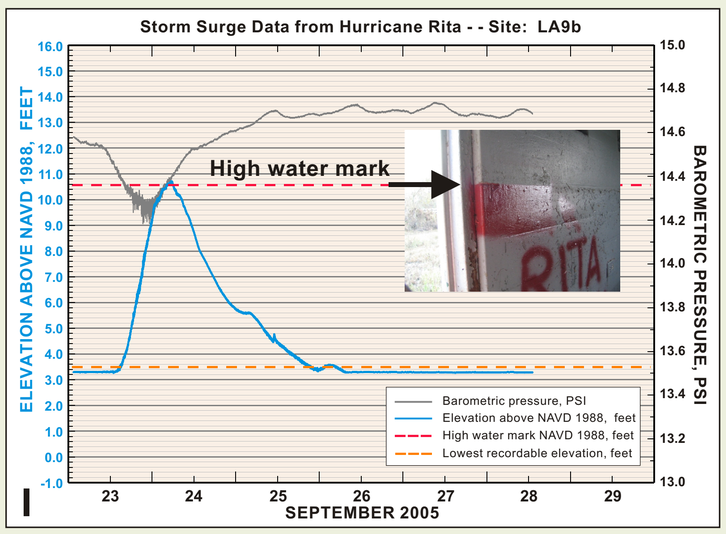
Hurricane Rita made landfall early on the morning of September 24, 2005. Of the 34 water-level sensors, significant inundation occurred at 24 representing an area of approximately 4,000 square miles. Water-level data for these sites were corrected for salinity (water density) and barometric pressure and related to the North American Vertical Datum of 1988 using a real-time kinematic global-positioning system survey.

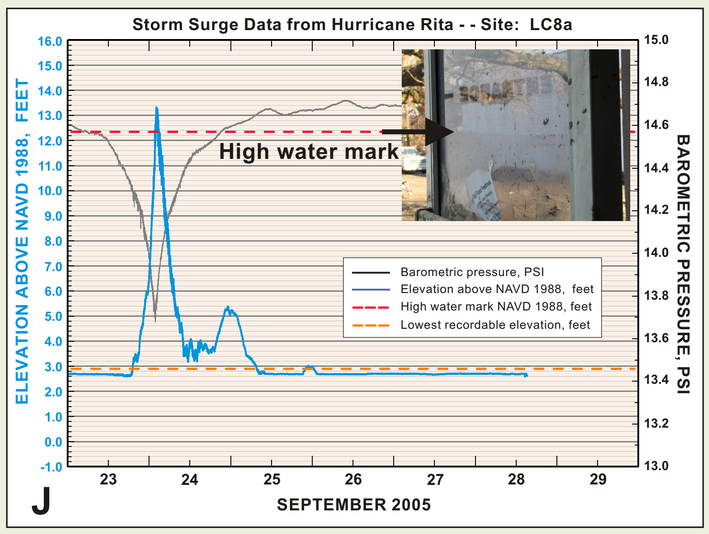


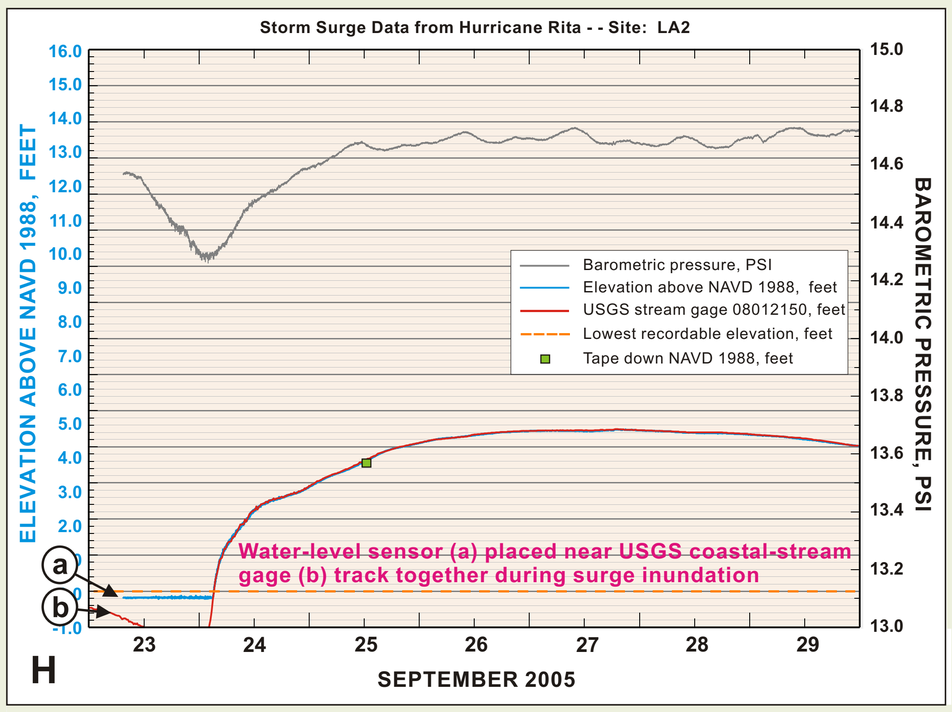
Quality-Assuring the Water-Level Data

At selected sites, multiple water-level sensors were deployed to measure the variability between individual sensors and existing USGS stream gages. Water-level data collected by the clustered sensors agreed closely with each other (G) and with water-level data from USGS stream gages (H).

Comparisons between high-water marks and peak storm surge measured by the water-level sensors varied with the quality of the high-water mark. High-water marks rated as “excellent” agreed closely with the storm-surge peaks recorded by the sensors (I), while high-water marks of lesser quality were consistently **lower** than the maximum elevations indicated by the sensors (J).





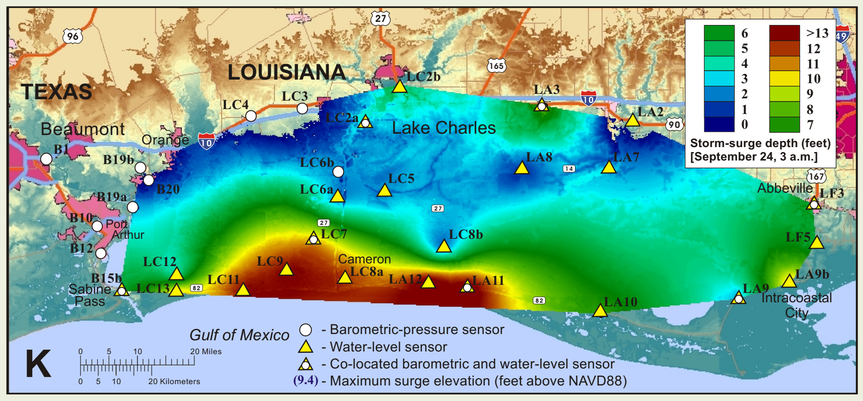


Results

Hydrographs of storm-surge data (G, H, I, and J) depict water-levels before, during, and after landfall of Hurricane Rita. Based on sensor data, maximum storm surge exceeded **14 feet** above NAVD of 1988 at Constance Beach (LC11), Creole (LA12), and Grand Chenier (LA11), Louisiana, about 20 miles, 48 miles, and 54 miles east of Sabine Pass, Texas (B). Water levels increased eastward from the Sabine River into southwest Louisiana. In general, the magnitude of the storm surge was greatest near the coast and decreased inland through the approximate latitude of Interstate-10. Riverine flows near Interstate-10 contributed to flooding at some locations (LA3). Sensors reported water-level rises during the storm surge in excess of 3 feet per hour at many locations.

Interpolating water-level data between sensor locations and overlaying the results onto a digital elevation model permits the visualization of the approximate extent of the flooded area and depths of associated flood waters before, during, and after landfall. For example, on September 24, 2005, 3 a.m., a flood wave (dark red area) is evident inland of the coast and along Louisiana Highway 82 from sensor sites LC11, LC9, LC8A, LA12, and LA11(K).

A description of the storm-surge network and sensors, as well as the storm-surge data are available via the world-wide-web at ***http://wwwrustla.er.usgs.gov/dataseries/dseries101/index.asp***.



Prepared by Benton D. McGee, Burl Goree, Roland W. Tollett, Dean Gesch, Marge Davenport, and Robert R. Mason, Jr. of the U.S. Geological Survey